

Montana Model Curriculum Framework:		
Unit of Study: Motion	Grade: K	Suggested Timeframe: Two Weeks
Unifying Concepts: motion, force, relationships, patterns, cause and effect		
Enduring Understandings:	Essential Questions:	Content Standards, Benchmarks, and Essential Learning Expectation:
<p>People (scientists) make observations and try to understand what is always true.</p> <p>Objects move in many different ways when pushed or pulled.</p>	<ul style="list-style-type: none"> How do objects move? How can you make an object move? How can you change an object's direction? What causes moving objects to stop? 	<p>Science Content Standard 1. Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate results and reasonable conclusions of scientific investigations.</p>
		<p>End of Grade 4 Benchmark 1.1 Develop the abilities necessary to safely conduct scientific inquiry, including (a step-by-step sequence is not implied): (a) asking questions about objects, events, and organisms in the environment, (b) planning and conducting simple investigations.</p> <p>ELE A. Make observations using the five senses</p> <p>ELE B. Record observations by drawing or orally explaining</p> <p>ELE C. Ask a question based on their observations</p> <p>ELE D. Follow appropriate safety rules</p> <p>ELE E. Conduct teacher guided scientific inquiry</p>
		<p>End of Grade 4 Benchmark 1.3. Use data to describe and communicate the results of scientific investigations</p> <p>ELE A. Communicate observations made during inquiry process.</p>
		<p>Science Content Standard 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.</p> <p>End of Grade 4 Benchmark 2.3. Identify the basic characteristics of light, heat, motion, magnetism, electricity, and sound.</p> <p>ELE B. Identify the different ways in which objects move (such as zig zag, round and round, back and forth, and fast and slow).</p> <p>ELE D. Describe the basic characteristics of light, magnetism, and motion</p>

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Assessments:		
<p>(Needs to be explained in kindergarten-friendly language. This information is written for the teacher.)</p> <p>Science Performance Rubric on Motion (see below)</p> <p>Culminating Unit Assessment: Rube Goldberg Creation</p> <p>***Before beginning this unit the teacher should begin gathering a variety of inexpensive materials for use during the culminating assessment. Many of these items can be found around the house. A list of suggested items is included with this unit. It is recommended that the teacher send home a parent letter requesting any additional needed items before beginning the unit.</p> <p>Assessment for this unit should include opportunities for students to demonstrate understanding of the different ways objects can move, and that force (a push or pull) applied to an object causes it to move. For this assessment, students will work in small groups to create a Rube Goldberg machine. Rube Goldberg was an engineer who designed complicated contraptions to perform simple tasks. More information about Goldberg, including video links to some of his contraptions, can be found in the Resource Section. It will be beneficial for students to view some of the Rube Goldberg videos before beginning this assessment.</p> <ol style="list-style-type: none"> 1. Students will work in groups of 3-5 to create Rube Goldberg contraptions that demonstrate the different ways that objects can move (fast, slow, back and forth, zig zag, round and round).The teacher should encourage students to include as many different ways to move different objects within their contraptions as possible. 2. After the students have completed their contraptions the teacher should place chart/poster paper by each one that lists the categories for different ways objects can move (see example chart below). 3. Each group of students will visit another group's contraption and will complete the open boxes on the chart paper, indicating which of the objects on the contraption moved a particular way and what caused it to move, i.e., a rubber ball used in the contraption moves fast because it rolls down a ramp. Students may draw their answers, write their answers or do a combination of both. 4. The teacher should gather all of the students together to compare the different results on each of the charts. 		
Language of the Standards		
<p>Observation, observe, scientist, sight, distance, height, record, question, experiment, motion, movement, angle, direction, fast, slow, back, forth, zig zag, force, gravity, spin, cause, effect</p>		

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Additional Information:		
Common Misconceptions	Proper Conceptions	
1. Motion is a property of an object.	1. Objects move in many different ways when pushed or pulled.	
Resources for Teachers:		
<ul style="list-style-type: none">• Objects move in many different ways when pushed or pulled. Students can differentiate between the two as they pull. Question students about this experience and have them describe characteristics of objects that they could pull easily.• Introduce gravity. Help students to investigate and understand that most objects will fall if dropped.• Kindergarten children will enjoy exploring motion by interacting with materials that spin such as tops, gyroscopes, and other inexpensive spinning toys. Give them the opportunity to experiment with these toys to see how they work.• North American Indians invented tops. They were carved from stone, bone, or wood. Indian children wrapped a cord around the cone-shaped tops and then pulled on the string to make it spin. The spinning movement of the top was stronger than the pull of gravity. The top stood up and continued to spin until friction with the air caused the movement to weaken. Then the top slowed down and fell over. Share pictures (many can be found on the Internet) of some of the early versions of these toys and have students compare them to modern day spinning tops and toys.		
<p><u>Print Resources:</u></p> <p><u>American Indian Contributions to the World: Science and Technology</u> by Emory Dean Keoke and Kay Marie Porterfield, published by Facts on File, Inc. This book is one of a series that was given to each school district; it should be available in the school's media center. It is an excellent source of information about Native American contributions to the field of science and technology.</p> <p><u>Games of the North American Indians</u> by Stewart Culin, published by Dover Publications. This book covers over 200 Indian tribes and provides a wealth of information as well as photographs of the many toys that have been invented by North American Indians.</p> <p><u>I Fall Down</u> by Vicki Cobb, published by HarperCollins. This book tackles the subject of gravity through simple sentence structure and language. The author provides a series of experiments for parents and children to do together.</p> <p><u>Online Resources:</u></p> <p>Rube Goldberg YouTube Videos</p> <p>Star Wars YouTube Volkswagen Commercial- Force</p>		

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Cross-Curricular Content Standards, Benchmarks, and Essential Learning Expectations: Math Standards: 2.1 Representing Data: Collect, represent, and organize data in tables, dot plots, bar graphs, pictographs, and stem-and-leaf plots using technology when appropriate. 2.2 Evaluating Data: Solve problems and make decisions using data descriptors such as minimum, maximum, median, and mode within scientific and cultural contexts, including those of Montana American Indians. Information Literacy/ Library Media Content Standards: 1. A student must identify the task and determine the resources needed.		
Unit Authors: Mark Kane, Laurel Public Schools Mary Larsen, Helena Public Schools		

Suggested Materials To Gather for Unit
****Watch Rube Goldberg videos for other ideas for materials**

variety of balls- rubber bouncy balls, golf balls, ping pong balls, etc.	small plastic building blocks	small and large toy wheels
rulers, yardsticks	empty small and large soft drink bottles	buttons, pennies, other small objects
toilet paper/paper towel cardboard tubes	wooden blocks and ramps	boxes
variety of spinning objects (large and small spinning tops, yoyos, gyroscopes, etc.)	Strong tape (for students to attach things together)	Small and large disposable plastic cups
string, yarn	Dominos	cardboard (recycled boxes are a great source)
marbles	magnets	empty yogurt and butter containers
toy cars	linking cubes	PVC pipe "elbows"

Performance Rubrics for Motion Unit of Study

Performance Rubrics: A set of criteria describing students' performance, along a continuum from novice to advanced, that define how well they apply the knowledge and skills contained in the Essential Learning Expectations.

Science Content Standard 2. Students, through the inquiry process, demonstrate the knowledge of properties, forms, changes and interactions of physical and chemical systems.


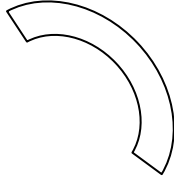
Big Idea: Essential Learning Expectation B: Motion

Criteria	Novice	Nearing Proficiency	Proficient	Advanced
Motion	Student identifies an object in motion, but cannot identify what type of motion is displayed (i.e. zigzag, round and round, back and forth, and fast and slow).	Student identifies some, but not all, the different ways in which objects move, i.e. zigzag, round and round, back and forth, and fast and slow.	Student identifies the different ways in which objects move, i.e. zigzag, round and round, back and forth, and fast and slow.	Student uses multiple ways to show differences in which objects move, i.e. zigzag, round and round, back and forth, and fast and slow.

Information Literacy/Library Media Standard 1: A student must identify the task and determine the resources needed.

Criteria	Novice	Nearing Proficiency	Proficient	Advanced
Define the problem	<p>C. Student listens and retells the topic omitting most details</p> <p>D. Student listens to the steps needed to solve the problem or task with frequent redirection</p>	<p>C. Student listens and retells the topic with limited details</p> <p>D. Student listens to the steps needed to solve the problem or task with some redirection</p>	<p>C. Student listens and retells the topic</p> <p>D. Student listens to the steps needed to solve the problem or task</p>	<p>C. Student listens and retells the topic with elaborate detail</p> <p>D. Student listens to and anticipates the steps needed to solve the problem or task</p>

Example of Student Assessment Chart/Poster

Ways Objects Moved	Which Object Moved This Way? Student Descriptions (drawings and/or narratives)	What Caused the Object to Move This Way? Student Descriptions (drawings and/or narratives)
Object Moved Fast		 The car went fast down a ramp.
Object Moved Slow		
Object Dropped		
Object Stopped		
Object Moved Round and Round		
Object Moved Zig Zag		
Object Moved Back and Forth		

